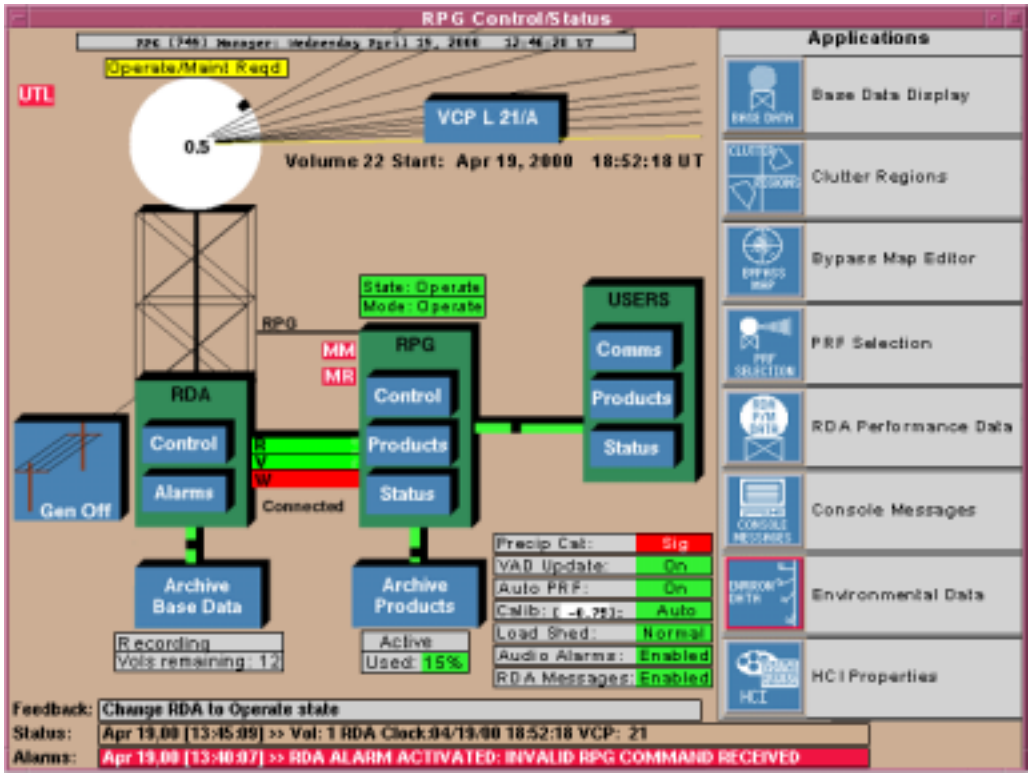
Distance Learning Operations Course

IC 5.6: System Operations and Control



Presented by the Warning Decision Training Branch

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Preface

Introduction

This document is provided as a part of the Warning Decision Training Branch (WDTB) Distance Learning Operations Course (DLOC). With the completion of the deployment of the open architecture RPG (RPG) references to the legacy RPG have been removed from this document. The RPG features presented in this document have been updated for RPG Build 4.0. Deployment for RPG Build 4.0 begins in late September, 2003.

Reference material in this document for the RPG is provided by the RPG Electronic Performance Support System (EPSS). The EPSS is available at the RPG workstation and on the ROC Website (http://www.roc.noaa.gov/osteam/osmain.asp).

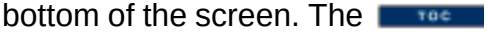
How to Use this Document

This document is provided in a web based format for the convenience of the reader, and to allow for future build updates. As a result, information extracted from the RPG EPSS is provided through links to other web documents. A PDF version of this document suitable for printing is also available on the WDTB website. In order to view the PDF version, the user must install Adobe's Acrobat Reader.

Links

When clicking on the links that are related to RPG EPSS information, a new browser window will open. ***By default, the EPSS windows will stay "on top" of any other browser windows. To continue reading in this document, close the EPSS window by clicking on the "Close Window" button, or the "X" button on the upper right side of the EPSS window.*** The EPSS information will also appear in a better format if the EPSS browser window is not maximized.

Navigation

To navigate through the website version of this Instructional Component (IC), simply use the buttons found at the top and bottom of the screen. The 

button will return you to the Table of Contents page. The 

button will take you to the previous page and the 

button will display the next page in the document.

You can also easily navigate the document by viewing the Table of Contents. The Table of Contents contains links to each section of the document. You may return to the WDTB home page by clicking on the small WDTB logo found at the top and bottom of each page.

Feedback

We encourage users of this document to provide feedback to our staff. To send email to the WDTB Webmaster, click on the Webmaster email link found at the bottom of each page. You may also send feedback via the Feedback Form on the WDTB home page at:

http://wdtb.noaa.gov/. Simply click on the “Feedback” link and enter your comments on the form.

Other Training

WDTB provides training to National Weather Service personnel. However, training materials on our website are available to anyone. Additional information about WDTB training is available on the WDTB home page at: http://wdtb.noaa.gov.

Introduction

Overview

The WSR-88D is a system comprised of several major components, one of which is the Radar Product Generator (RPG). The original RPG has been replaced in a significant upgrade. Ending in early 2002, deployment of the new Open Architecture RPG completely replaced the legacy RPG. As a result, training will no longer be provided on the legacy system. Also, this training presents the features of RPG Build 4.0, deployed beginning in September, 2003.

The radar operator interacts with the RPG through the Human Computer Interface (HCI). This Instructional Component (IC) will present a series of tasks (ranging from routine to rare but operationally significant) with a description of why the task is important. Links to the steps to perform the task are provided in this document. These steps are described in the RPG EPSS -- the same EPSS that is resident at the RPG HCI workstation.

Testing

After reviewing this document, DLOC students may take the exam, Exam 4, for IC 5.6 when you are prepared. Exam 4 covers this topic and is an online exam in the same format as the previous exams. Test questions focus on the purpose behind performing a task, rather than the steps involved in completing the task. As with other exams, your Training Officer will provide the details for taking the exam.

Objectives

The objectives identify the important information you should retain from studying this IC. Questions on the exam will reflect the topics described in these objectives.

1. Identify the reason for assessing wideband communications status and connecting or disconnecting a wideband line.
2. Identify the reason for assessing narrowband communications status and connecting or disconnecting a narrowband line.
3. Identify the reason for assessing Archive II status and the meaning of the various status entries.
4. Identify the reason for assessing Archive III status and the meaning of the various status entries.
5. Identify purposes for accessing the current VCP.
6. Identify the difference between Adaptation and Default VCPs.
7. Identify the meaning of various status entries for RDA State and Operable Status.
8. Identify characteristics of defining a Clutter Suppression Regions file and when a file takes effect once downloaded.
9. Identify the purpose of Auto PRF and appropriate situations for changing the PRF manually.
10. Identify the reason for assessing RPG status and the three categories for RPG Alarms.
11. Identify the reason for accessing and editing the Environmental Wind Table.

12. Identify the reason for accessing and editing the Hail Detection Algorithm temperature heights.

System Status

A key issue related to operating the WSR-88D is the status of the system. With the new open architecture Radar Product Generator (RPG), investigating system status is easier than ever before. The Human Computer Interface (HCI) is designed to allow system problems to stand out to the operator.

With the new design of the open architecture HCI, you can assess the status of your radar with just a glance at the screen. When status items are highlighted, usually in yellow or red colors, you can then investigate further into the underlying performance issues of the radar. The rest of this module will address the basics of these issues.

For a concise description of HCI status information, visit the Human Computer Interface Status Information web page.

HCI Status Information	
Netscape 4.75	Internet Explorer 5.5

Click on the link above for your type of browser. In the window that opens, click on the “Human Computer Interface Status Information” item.

RPG Status

The RPG is another significant component of the WSR-88D that requires status monitoring. Consistent, timely, high quality radar products depend on the viability of the RPG. Information on the status of the RPG is readily available.

The RPG monitors all of its major subfunctions. When one of its major subfunctions fails or becomes degraded, an RPG alarm indicator is displayed on the HCI. The RPG Alarms menu provides more detailed identification of the failed or degraded subfunction. The link below describes details of interacting with these messages and alarms.

Assess RPG Status (RPG Alarms)
RPG Status

Categories of Subfunctions

The components are divided into three categories based on their failure's impact on system performance. The three categories are Maintenance Required, Maintenance Mandatory, and Load Shed.

Maintenance Required - Failure of the following components causes degraded system operation.

- **Distribution** - The equipment for one or more communications links used to distribute products.

- **Archive III Failure**- The Archive Level III recording device.
- **Replay Base Data Failure** - The mass storage device (hard disk drive) used to store base data. This hard drive may be the same drive used for product storage.
- **Task Failure** - An Applications software task has paused. The name of the task will appear in the bottom portion of the screen.
- **BDDS** - The Base Data Distribution System is not operating or communication to the BDDS has failed. Note that this alarm occurs only for sites with a BDDS installed.

Maintenance Mandatory - Failure of the following components cause the entire WSR-88D system to be inoperable.

- **Control Task Failure -**
- **RDA Wideband** - The communications equipment used to receive base data and status from the RDA and transmit control commands from the RPG to the RDA.
- **Media Failure** -

Load Shed - Load shedding conditions cause degraded system operations. An alarm indicator in this category means load shedding is occurring for one of the six load shedding elements (CPU, Product Storage, RDA Radial, RPG Radial, Distribution, or Archive III).

Clearing Alarms

Automatically - If the alarm condition subsides (e.g., CPU load shedding occurs at a peak load time and stops, etc.,) the RPG will clear the alarm and the alarm indicators are removed.

Manually - The RPG alarms may be manually “Cleared” by the HCI operator. However, this functionality ***ONLY*** clears the alarm indicators on the HCI and ***DOES NOT*** clear the condition that caused the alarm.

RDA Status

The Reflectivity, Velocity, and Spectrum Width Base Data are generated at the RDA and transmitted via the wideband to the RPG. High quality Base Data are dependent on the viability of the RDA components. Regularly assessing RDA status is an important monitoring tool for maintaining a good operating condition at the RDA.

Assess RDA Status
RDA Status

RDA State

The RDA State is the operational state of the RDA. Possible entries are:

- **Standby** - The radar is not emitting energy.
- **Restart** - RDA undergoing restart.
- **Operate** - The normal state for normal operations of the radar.
- **Startup** - RDA undergoing startup.
- **Offline Operate** - System is operational, but not collecting data (redundant systems only).
- **Playback** - Playback mode is not available to field sites at this time and is not selectable by the radar operator.

- **Blank** - Status not available.

RDA Control Functions & RDA State
RDA Operate
RDA Restart
RDA Standby

RDA Control

The RDA is controlled remotely via the RPG HCI and locally via the RDA Maintenance Console. Under normal operating conditions, the RDA Control setting is “Remote”, meaning the RDA can be commanded from the RPG HCI. When maintenance is being performed at the RDA site, the RDA Maintenance Console will need control of the RDA. When the RDA Control is then set to “Local”, no RDA related commands can be sent from the RPG.

Control of the RDA
RDA Status - Determine Control
Acquire Remote Control

Control of the RDA
Enable Local Control

RDA Alarms

Various items at the RDA can trigger alarms. Typical items include: tower (CTR), pedestal (PED), transmitter (XMT), receiver/signal processor (RSP), user (USR), wideband (WID), and archive (ARC).

RDA Alarms
Display/Sort RDA Alarms

It is beyond the scope of this course to discuss procedures related to clearing the RDA alarms.

Communications

Wideband Communications

The wideband is the communications link between the RDA and the RPG, and being able to assess the status of this link on a routine basis is important. There may be times where it is necessary to disconnect, then reconnect the wideband line. It is typically done in coordination with an ET, or perhaps by request from the relevant company providing the communications line.

Managing the Wideband Connection
Wideband Communications - Connect
Wideband Communications - Disconnect

Narrowband Communications

Compared to the wideband, narrowband communications normally require the attention of an operator more frequently. The number of users connected to any particular RPG affects the frequency of interactions needed to maintain the communications lines. Narrowband lines are of two types: dedicated or dial-up. The possible status entries are dependent on the type of communications line.

This section on narrowband communications emphasizes the necessary steps to assess the status of a narrowband line, as well as connecting or disconnecting that line.

Assess Narrowband Status
Product Distribution (Narrowband) Communications – Status Information

Why to Connect/Disconnect Narrowband

There may be times when communications lines have problems. A common problem is the “noisy line”. This problem can often be resolved by disconnecting and reconnecting the narrowband lines.

Narrowband Connections
Product Distribution (Narrowband) Communications – Line Control

Archive

Archive II

Archive II is an archive of base data (reflectivity, velocity, and spectrum width). Though active upon deployment of the WSR-88D, Archive II is not being utilized at all sites. At some offices, the base data are transmitted through high speed internet connections directly to NCDC. The following instructions are relevant to sites where Archive II data are still being recorded and shipped to NCDC.

Archive II is located at the RDA. There is no impact on procedures at the RDA due to open architecture RPG implementation. However, the interface used by the operator has changed.

Archive II Tasks
Archive II - Status
Archive II Recording
Stopping Archive II

Archive III

Archive Level III, an archive of radar products, is collected at the RPG. The **Program Management Committee (PMC)** specifies which sites will participate in the National Archive

Program and what data will be archived to support this program. Changes to the National Archive Program are NOT permitted without specific authorization from the PMC.

Why to assess Archive III Status

Since Archive Level III is mandated by the PMC, the radar operator needs to monitor status of the Archive III process. In the open architecture RPG, Archive III has changed in both physical media and user interface. The radar operator must monitor the amount of media available for recording and change media when appropriate.

Archive III Tasks
Archive III - Status
Archive III - Auto Archive
Archive III - Cancelling

VCP

Appropriate Volume Coverage Pattern (VCP) selection can have a significant impact on WSR-88D operations. The first consideration is the sampling capability of a VCP. For example, if storms are at mid to long ranges, VCP 11 and 21 would offer similar sampling, though VCP 11 offers faster updates. If storms are at a closer range, VCP 11 has fewer elevation angle gaps and offers better sampling of the storm at mid levels.

Current VCP

There are three types of VCPs in the system: Adaptation, Default, and Current. The Current VCP is the VCP that is currently in effect. The origin of this VCP could be either Adaptation or Default VCPs. The current VCP may be edited to avoid problems with range folding on velocity and spectrum width products.

The HCI provides a tabular interface in addition to the graphical interface for editing the VCP. Editing the VCP via the table provides an interesting alternative.

Editing the Current VCP
Current VCP Modification - Graphical
Current VCP Modification - Tabular

Once modified, the Current VCP must be downloaded in order to take effect. Also, see the information about Auto PRF when editing VCPs of any type.

Downloading the Current VCP
Volume Coverage Patterns (VCPs) - Downloading

Adaptation VCP

There are four copies of the VCPs resident on the RPG hard drive known as ***Adaptation VCPs***. The ***Download*** command is used to invoke an ***Adaptation VCP***. A second consideration for VCP selection is the Doppler PRF initially available. They are part of the RPG's Adaptation Data. The Doppler PRF for Adaptation VCPs 11 and 21 is PRF #4, which offers an R_{max} of about 94 nm. Downloading Adaptation VCP 11 or 21 from the RPG to the RDA is a quick way to change to PRF #4. The Adaptation VCPs can be modified by the radar operator. (This will be discussed in RDA Control.)

Why to Download an Adaptation (RPG) VCP

Remember, the Adaptation VCPs reside at the RPG. In order to be active, they must be downloaded to the RDA. Downloading Adaptation VCP 11 or 21 from the RPG to the RDA

is a quick way to change to PRF #4. By changing to an Adaptation VCP from a Default VCP you can quickly change the R_{max} from 80 nm to 94 nm.

Downloading an Adaptation (RPG) VCP
Volume Coverage Patterns (VCPs) - Downloading

Default VCPs

There are four copies of the VCPs resident on the RDA hard drive known as ***Default*** VCPs. They are part of the RDA's Adaptation Data. The ***Change*** command is used to invoke a ***Default*** VCP. The Doppler PRF for Default VCPs 11 and 21 is PRF #5, which offers an R_{max} of about 80 nm. Changing to the Default VCP 11 or 21 at the RDA is a quick way to change to PRF #5. The Default VCPs cannot be modified.

A Note About Auto PRF

The WSR-88D has a function called Auto PRF which adjusts the PRF used in a Volume Scan to reduce overall range folded, or range obscured data on the Doppler mode products. (This is the "Purple" data on the Velocity and Spectrum Width products.) As a result, the ***Auto PRF function must be turned off*** if the radar operator manually edits and downloads a VCP in order to modify the PRF to unmask a storm of interest. See "Auto PRF" for more information.

Why to Change to a Default (RDA) VCP

Remember, the Default VCPs reside at the RDA. Therefore, they are not editable by the radar operator. Changing to the Default VCP 11 or 21 at the RDA is a quick way to change to PRF #5. By changing to a Default VCP from an Adaptation VCP you can quickly change the R_{max} from 94 nm to 80 nm.

Changing to a Default (RDA) VCP
Volume Coverage Patterns (VCPs) - Changing

How to *modify* the current VCP is discussed in RDA Control.

Clutter Control

Appropriate Clutter Suppression can have a significant impact on the quality of the Base Data. Several examples were presented in ***IC5.3: Principles of Meteorological Doppler Radar.*** In these examples, significant features were unmasked by the appropriate application of clutter suppression. In other examples, inappropriate clutter suppression resulted in data quality problems such as oversuppression of reflectivities in the mid levels of a severe storm.

Effective clutter suppression is dependent on applying the appropriate type of clutter filtering to the clutter problem. The Bypass Map is designed to filter normal ground clutter and should be in effect most of the time. For transient clutter, i.e. Anomalous Propagation, filtering for all the bins within the geographic area defined must be applied.

Defining Clutter Control
Clutter Suppression - Editing
Clutter Suppression - Downloading

Once the defined clutter suppression regions are downloaded, the new region definitions will take effect at the beginning of the next volume scan. Of course, the radar operator can perform a Volume Scan Restart in order to make the clutter suppression region definitions active sooner. These definitions will remain active until a new clutter suppression region file is downloaded to the RDA.

RDA Control

The Current VCP: VMI and PRF

The current VCP defines some important elements beyond the number of elevation angles being sampled in a fixed period of time. One important item defined in the current VCP is the Velocity Measurement Increment (VMI). The VMI can be either 0.97 or 1.94 kts, allowing two different ranges of velocity values on the products. A VMI of 0.97 kts results in velocities displayed up to +/-123 kts, while a VMI of 1.94 kts results in velocities displayed up to +/-246 kts. Though the VMI of 0.97 kts is employed more frequently, 1.94 kts may be employed for significant wind events such as a hurricane landfall.

A far more common reason for accessing the current VCP would be to edit the Doppler PRF. Auto PRF is effective for minimizing range folding overall, but a manual PRF change will be necessary when a particularly important feature is masked by range folding.

Auto PRF

The Auto PRF function automatically adjusts the PRF used in a Volume Scan. The radar examines the lowest elevation slice and modifies the PRF in order to reduce overall range folded, or range obscured data on the Doppler mode products (the “Purple” data on the Velocity and Spectrum Width products). As a result, the ***Auto PRF function must be turned off*** if the radar operator manually edits the VCP or downloads a VCP in order to modify the PRF to unmask a storm of interest. If Auto PRF is not turned off, the radar may change the PRF in order to reduce the range folded data, overwriting the changes made by the radar operator.

Modifying Auto PRF

Auto PRF

Why to Change the PRF Manually

The most common reason for manually editing the PRF is to manipulate the location of the range obscured data. In the typical scenario, a significant weather event, such as a severe thunderstorm, is moving into an area where range obscured data is prevalent. In this case, the radar operator can edit the VCP to change the PRF. Changing the PRF effectively causes the R_{max} to be moved which, in turn, causes a change in the configuration of over-laid echoes. The final result on the product is a modification in the location of the range obscured data. (This issue was covered in detail in IC 5.3: Principles of Meteorological Doppler Radar.)

Edit the Current VCP PRF

Current VCP Modification

Edit the Adaptation VCP PRF

Adaptation VCP Modification

Environmental Data

Environmental Data has three elements with different purposes. The ***default storm motion*** is used by the SCIT algorithm for newly formed storms. It is usually not changed frequently. The ***Hail Temperature heights*** support the Hail Algorithm and should be updated regularly any time the Hail Algorithm output is used. The ***Environmental Winds Table*** is used by several algorithms in the system.

Environmental Winds

The most frequently accessed element of Environmental Data is the Environmental Winds Table (EWT). The EWT supports the Velocity Dealiasing Algorithm, and must be checked regularly throughout the year. It is typically checked and updated if necessary twice a day, when new upper winds data are available from soundings.

The Environmental Winds Table
Graphical Editing of the Environmental WInds
Auto VAD Update
Tabular Editing of the Environmental Winds

HDA Temperature Heights

The adaptable parameters for the Hail Detection Algorithm (HDA) are available here in the Environmental Data area. The radar operator should routinely monitor the environmental winds as well as the HDA temperature heights. Adjusting these values will provide the most accurate output from the HDA possible.

Editing the HDA Temperature Heights
Graphical Editing of Hail Temperatures

Sending Messages

Any particular RPG can have numerous users, which need to be notified whenever something happens that affects the data availability. The messaging feature allows communication to the users for events which will disrupt the data flow. Preventive maintenance is a typical example of an opportunity to send out messages to your users.

Sending Messages
Console Messages – Composition/Dissemination

Summary

This IC has provided an overview of significant functions for the radar operator to perform. To complete the IC, you can now take Exam 4.

DLOC students, see your Training Officer for details on accessing the exam.